results with those elements which M. Mechain obtained by Laplace's method, with those obtained by Legendre himself, and with those ultimately deduced as corrected elements from the latest observations, how near an approximation is obtained by the method here given; so that the apparent errors seem rather to be those of observation, which, in fact, are not susceptible of great accuracy even with the best instruments, and with the greatest care, on account of the haze or coma with which these bodies are generally surrounded.

On the Affections of Light transmitted through crystallized Bodies. By David Brewster, *LL.D. F.R.S. Edin. and F.S.A. Edin. In a Letter to Sir* Humphry Davy, *LL.D. F.R.S.* Read December 23, 1813. [*Phil. Trans.* 1814, *p.* 187.]

The present experiments, to which the author has been led by discovering the singular property of agate described in his former communication to the Society, have been attended with results which he considers so extraordinary, that they appear to lead to the very mysteries of physical optics, and exhibit, he says, a series of appearances, which far surpass in splendour and variety all other phenomena of light.

This paper treats, first, of the polarizing power of the agate; secondly, on that structure of the agate on which its properties depend; thirdly, on peculiar colours exhibited by it; fourthly, on the depolarization of light; and fifthly, on certain elliptic coloured rings produced by obliquely depolarizing crystals.

With respect to the polarizing power of the agate, Dr. Brewster has before shown that a ray of light transmitted through a slice of laminated agate, cut at right angles to its laminæ, may be transmitted through a prism of Iceland spar without being subdivided, being refracted ordinarily in one direction, and extraordinarily when the principal section of the spar is transverse to the laminæ of the agate. The author observed at that time a nebulous light that accompanied the bright image of a luminous object seen through the agate, consisting of rays that were not *similarly* affected. He now adds, that this nebulous light is *oppositely* affected, being refracted like the extraordinary rays transmitted through Iceland spar, and accordingly disappearing when the bright image is most discernible, and *vice versâ*. But though the polarization of these rays be different, the refraction of both is the same.

In order to convey, as accurately as may be, an idea of the structure of the agate having these properties, the author assists his description by delineations of the appearances which the substance itself presents in consequence of the variations in fineness of the laminæ, their curvatures, or opacity. Some of the laminæ are white, others transparent; some straight, others variously curved; and where finest and most transparent, exhibiting an appearance of small waves on a surface of water rippled by a gentle breeze, and depending on small variations of the inclination of the laminæ.

In this communication the author again notices certain coloured images, seen on each side of the flame of a candle, or other luminous object seen through the agate, one at $10\frac{1}{2}°$, and a second at 21°, but which he is not yet able to explain, and supposes to be a new case of production of colours.

Dr. Brewster next gives the result of experiments on the transmission of light previously polarized, through various substances, and notices those positions of crystallized bodies in which the polarization continues unchanged, and those intermediate positions at which complete depolarization takes place; and adds, that such effects are also occasioned by plates of horn, gum-arabic, glue, tortoise-shell, and even plate glass.

In addition to these properties, which mica, topaz, and rock crystal possess in common with other crystallized bodies, Dr. Brewster observes, that they have the power of depolarizing in certain oblique positions, which he considers peculiar to them. And at the same time these bodies have certain oblique positions in which they do not depolarize, and which he terms neutral.

In the preceding experiments depolarization has been effected by the interposition of a second body, through which the rays are transmitted after having been previously modified by some polarizing substance; but the author observes that these effects may both be produced by the same crystals, if the direction of the light be such, that after reflection from the posterior surface it will coincide with the oblique depolarizing axis.

It was in attending to the affections of light thus polarized and depolarized by a plate of topaz $\frac{1}{10\frac{1}{0}}$th of an inch in thickness, that the author observed certain elliptical coloured rings, which he considers entirely new; and as he thinks them important, he takes much pains to describe their various dimensions and successions of colours, and represents them in coloured drawings.

When a doubly-refracting substance is employed to view these rings, the two images seen of them are differently coloured, the colours of one set being complementary to those of the other.

When a plate of agate, or a plane reflector at a specific angle of inclination are employed, then only one or the other set is seen, according to the relative position of the planes of incidence; and it is in the instance of using the plane reflector, that these rings appear with such peculiar brilliancy on account of the absence of all foreign light, which can, in this mode of making the experiment, be completely avoided.

In addition to the above experiments, of which the author gives a detailed account, he remarks, that light reflected at a particular angle from the surface of blue steel is polarized, and thence infers that the oxide is a thin transparent film; that light is partially polarized by reflection from all metallic surfaces.

That light from white clouds or blue sky is partially polarized, but that no part of the moon's light has suffered any degree of polarization.